REMARKS

This is in response to the Office Action that was mailed on November 10, 2003. Independent Claim 23 has been amended to recite the disclosed percentages by weight of the fuel and the basic metal nitrate components of the inventive compositions, in accordance with the disclosure in the first and second paragraphs on page 29. Independent claim 23 has also been amended to incorporate the recitation of former claim 32. Finally, independent claim 23 has been amended to recite the particle diameter of the basic metal nitrate, in accordance with the disclosure in the paragraph bridging pages 6-7 of the specification. See also page 13 ("it is preferable that at least requirement (a) is met. requirement (a): a particle diameter being 0.5 to 40 μm"). Minor formal amendments have been made to other claims. No new matter has been introduced. Claims 25-28, 31-33, 35-38,41-49, 53-64, 66, 70-72, and 74 are cancelled, without prejudice to their subject matter or to their reassertion in this or a continuing application. Claims 23, 24, 29, 30, 34, 39, 40, 50-52, 65, 67-69, and 73 are pending in this application.

As demonstrated in the present specification, compositions of the present invention have excellent thermal stability. For instance, even after standing in a high temperature atmosphere for 10 or more years, they do not decompose. Specification, page 12, first full paragraph. The present application now contains claims that recite two overlapping inventions. Claims 23, 24, 29, 30, 34, 39, 40, 50-52, 65, and 73 are drawn to a compositional invention embodiment characterized by the presence of basic metal nitrate having a particle diameter in the range of 0.5 to 40 μm (the BASIC METAL NITRATE PARTICLE DIAMETER INVENTION). Claims 67-69 are drawn to a compositional invention embodiment characterized by the

presence of a sodium carboxymethylcellulose binder (the SODIUM CARBOXYMETHYLCELLULOSE BINDER INVENTION). It is respectfully urged that all of the claims remaining in this application can and should be examined in this application, and the Examiner is respectfully requested to modify the restriction requirement accordingly.

THE BASIC METAL NITRATE PARTICLE DIAMETER INVENTION

The recited basic metal nitrate particle diameter feature of this embodiment of the present invention provides the claimed compositions with unexpected improvement with respect to rapidity of ignition.

Claims 29, 30, 33, 34, 40, and 72-74 were rejected under the first paragraph of 35 U.S.C. §112, as allegedly being broader than the enabling disclosure. Claim 23 and all claims dependent therefrom have been amended, and it is respectfully submitted that claim 23 and all of the claims that depend therefrom are fully enabled by Applicants' 75-page specification.

Claims 29, 30, 33, 34, and 40 were rejected under the first paragraph of 35 U.S.C. §112, as allegedly omitting essential elements, namely the specific fuel, oxidizer, and binder, with amounts. All of these claims now specify amounts, and specific types of fuel and oxidizer. Inasmuch as the binder component of the claimed compositions is optional, details thereof are not recited in Applicants' most generic claim. It is respectfully submitted that the claims in their present form satisfy the requirements of the statute.

Claims 29, 30, 33, 34, and 40 were rejected under the first paragraph of 35 U.S.C. §112 and under 35 U.S.C. §101, as allegedly being improper "use" claims. Claims 72 and 74 have been cancelled. Claim 73 in its present form is

not a "use" claim.

Claims 23, 24, 29, 30, 33, 34, 39, and 40 were rejected under 35 U.S.C. §102(b) as being anticipated by US 5,608,183 (Barnes). Barnes neither teaches nor suggests compositions that comprise from 10 to 60 weight-% of a tetrazole derivative or a guanidine derivative and from 40 to 90 weight-% of a basic metal nitrate having a particle diameter of 0.5 to 40 μm. The Barnes patent (which is only 3 pages long, including its bibliographic page and its claims) provides no teachings at all concerning the form in which the basic metal nitrate should be used. As demonstrated in the present specification, compositions of the present invention have excellent thermal stability. For instance, even after standing in a high temperature atmosphere for 10 or more years, they do not decompose. Specification, page 12, first full paragraph.

Claims 23, 24, 29, 30, 33, 34, 39, and 40 were rejected under 35 U.S.C. §102(e) as being anticipated by US 5,841,065 (Mendenhall). Inasmuch as the filing date of the present application is 27 September 2000 and the reference patent issued on 24 November 1998, it would appear that the proper section of the statute is §102(b). In any event, Mendenhall neither teaches nor suggests compositions that comprise from 10 to 60 weight-% of a tetrazole derivative or a guanidine derivative and from 40 to 90 weight-% of a basic metal nitrate having a particle diameter of 0.5 to 40 μm. The Mendenhall patent (which is even shorter than the Barnes patent) provides no teachings at all concerning the form in which the basic metal nitrate should be used. (As demonstrated in the present specification, compositions of the present invention have excellent thermal stability. For instance, even after standing in a high temperature atmosphere for 10 or more years, they do not decompose. Specification, page 12, first full paragraph.)

THE SODIUM CARBOXYMETHYLCELLULOSE BINDER INVENTION

The recited sodium carboxymethylcellulose binder feature of this embodiment of the present invention provides the claimed compositions with unexpected improvement with respect to reduction in carbon monoxide generation.

Claims 67 and 68 were rejected under 35 U.S.C. §103(a) as being unpatentable over Barnes or Mendenhall in view of US 5,780,767 (Matsuda), US 6,468,369 (Zhou), or US 5,834,679 (Seeger). The Examiner admits that Barnes and Mendenhall fail to disclose or suggest the sodium carboxymethylcellulose component of the presently claimed compositions, but argues that the ancillary references are suggestive of substituting sodium carboxymethylcellulose for the guar gum of the primary references.

Even assuming that the ancillary references serve to establish a *prima facie* case of obviousness with respect to the invention of claims 67-69, Applicants present herewith the Declaration under 37 CFR 1.132 of Dr. Jianzhou WU. The Declaration of Dr. WU provides evidence of the unexpected superiority of the compositions of the present invention as compared to the properties of the compositions of the primary references. Specifically, the presently claimed compositions surprisingly generate significantly smaller amounts of noxious carbon monoxide gas than do the corresponding prior art compositions.

The primary references indicate that gas generating compositions should be non-toxic. See e.g. Barnes, column 1, lines 13-25. Matsuda, on the other hand, shows an azide compound or an organic compound such as a dicyandiamide as a fuel. The use of azide compounds as in Matsuda is directly contrary to the teaching of the primary references regarding non-toxicity. Therefore the combination of Matsuda with Barnes or Mendenhall is improper.

Also, dicyandiamide is reactive with BCN, so that the use of such compounds is impossible in gas generating compositions. In any case, the GN/BCN/CMCNa composition of the present invention is unexpectedly superior to the compositions of Examples 18 and 19 of Matsuda.

Zhou shows a phase stabilized ammonium nitrate having a very low melting point. If this compound is used in a gas generating composition, combustion must be effected at a high pressure. For this reason, it is not proper to combine Zhou with Barnes or Mendenhall. The combustion disclosed by the primary references will not be obtained with the suggested combination of Barnes or Mendenhall with Zhou. Applicants note that compositions of the present invention can have a pressure exponent of 0.32, whereas the Zhou compositions have a pressure exponent of 0.42 to 0.85. The correlation between burning rate and burning pressure is $r = a \times P^n$, in which "n" is a pressure exponent (pressure index) and "a" is a constant depending on the kind of gas generating agent. In gas generating agents having a small value of "n", the burning rate does not change greatly even with small changes in the pressure P. Gas generating agents having large "n" values change greatly in burning rate, depending on pressure changes during combustion and changes in the inner pressure of the inflator caused by ambient temperatures. It is difficult to obtain good gas generating agents having high burning rates. In other words, the larger the pressure exponent is, the more difficult it is to control the combustion property, and unexpected deployment of air bags caused by excess pressure output may injure people. Finally, it is noted that the burning rates of the present invention (e.g., approximately 10 mm/s at 70 kg/cm^2, are superior to Examples 1-4 of Zhou, which have burning rates of less than 5 mm/s at 70 kg/cm^2) because low burning rate compositions cannot be burnt within the 20-40 ms time frame needed for good inflator performance.

Seeger shows an auto ignition material (AIM) composition, where the AIM composition is placed in a combustion chamber but separated from a gas

generating agent, as shown in Seeger's Figures 2-5. The amount of the AIM composition is 60 to 150 mg and the composition contains about 1% to 50% (0.6 to 75 mg) of a binder. The auto ignition material is used in a small amount in a separate form from a gas generating agent. When a car with an air bag system that includes AIM is involved in a fire, the AIM will burn automatically before the housing is heated to the point where it loses strength and breaks up. If no AIM is included, the housing will be heated by the fire to the point where it loses strength and the gas generating agent will then burn and break the weakened housing, potentially injuring passengers. Also, Seeger's compositions contain $Pb(SCN)_2$ and will thus generate poisonous lead and cyanide gases.

The combinations of the Matsuda, Zhou, and Seeger references with the Barnes and Mendenhall references fail to suggest the unexpected improvement in properties (in particular, reduction in carbon monoxide emissions) provided by the present invention.

Accordingly, for the reasons given above, it is respectfully submitted that the present claims satisfy the formal requirements of the statute, and that the presently claimed invention is patentable over the prior art of record. The Examiner is respectfully requested to pass this application to Issue.

Should there be any outstanding issues to be resolved in the present application, the Examiner is respectfully requested to contact the undersigned by telephone at the number listed below.

Pursuant to 37 C.F.R. §§ 1.17 and 1.136(a), Applicant(s) respectfully petition(s) for a two (2) month extension of time for filing a reply in connection with the present application, and the required fee of $420.00 is attached hereto.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

BIRCH, STEWART, KOLASCH & BIRCH, LLP

By _____
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0425-0851P

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Encl.: Rule 132 Declaration of Dr. WU

PATENT
0425-0851P

IN THE U.S. PATENT AND TRADEMARK OFFICE

Applicant:	ZHOU, et al.	Conf.:	7901
Appl. No.:	09/914,548	Group:	3641
Filed:	August 30, 2001	Examiner:	FELTON

For: BASIC METAL NITRATE, PROCESS FOR PRODUCING THE SAME AND GAS GENERATING AGENT COMPOSITION

DECLARATION UNDER 37 CFR 1.132

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

I, Dr. Jianzhou WU, hereby declare as follows:

I am one of the co-inventors of the invention described and claimed in the above-identified patent application.

I have carried out tests, described hereinbelow, in order to compare properties of inventive compositions and prior art compositions. The procedures followed in the tests and results of the testing are as follows:

1. Samples

The following chemical compounds were used to prepare the compositions being tested:

- guanidine nitrate ("GN"), lot #208505, obtained from Degussa AG.

- basic copper nitrate ("BCN"), lot #1017196, obtained from The Shepherd Chemical Company.
- guar gum ("GG"), lot #12006, obtained from Chuo Foods Material Co.
- sodium carboxymethylcellulose ("CMCNa"), lot #42105957, obtained from Daicel Chemical Industries Ltd.

2. Procedures

Preparation of compositions

Compositions were made up of guanidine nitrate, basic copper nitrate, and either guar gum or sodium carboxymethylcellulose. The compositions were hand-mixed in plastic bags for 5 minutes with 20 parts by weight of water based on 100 parts by weight of the compositional components. The resulting slurries were dried at 110°C for 2 hours. The dried compositions were used to prepare strands thereof for determination of burn rate and gas analyses.

Preparation of strands for determinations of burn rates

1.70 to 1.76 grams of a composition obtained as described above was introduced into a strand-molding die and molded at a pressure of about 900 kg/cm^2 into a strand having a diameter of about 9.6 mm and a length of about 12.7 mm. The resulting strands were dried at 110°C for 8 hours. After drying, the entire surface of each strand – except for one longitudinal end – was coated with a thin layer of epoxy resin. A pair of nichrome wires was connected to the uncoated end of the strand, to facilitate ignition by electric current.

BURN RATES. A strand was placed in a one liter tank and sealed, in a nitrogen atmosphere, at a pressure of 50, 70, and 90 kg/cm^2. Then the strand was subjected to combustion by means of electric ignition, and burning rates were calculated based on burn out time and the length of the strands.

Preparation of strands for gas analysises

2.00 grams of a composition obtained as described above was introduced into a strand-molding die and molded at a pressure of about 900 kg/cm^2. The resulting strands were dried at 110°C for 8 hours. The dried strands were tested in gas analysis.

GAS ANALYSIS. A strand was placed in a one-liter sealed tank, in a nitrogen atmosphere, at a pressure of 70 kg/cm^2. Then the strand was subjected to combustion by means of electric ignition. The produced gas in this way was introduced into a sampling bag. Amounts of carbon monoxide, nitrogen monoxide, nitrogen dioxide, and ammonia were measured with detector tubes (obtained from Gastech Company) under atmospheric pressure.

3. Results

	Comparison C	Invention A	Comparison D	Invention B
Composition	GN/BCN/GG 41.1/58.9/5.3 *Barnes '183*	GN/BCN/CMCNa 42.4/57.6/5.3 *present invention*	GN/BCN/GG 42.1/52.9/5.0 *Barnes '183*	GN/BCN/CMCNa 43.4/51.6/5.0 *present invention*
Oxygen balance (g/g)	0.008	0.008	-0.009	-0.009
Burning rates (mm/sec)				
@ 50 kg/cm^2	9.41	9.31	9.85	8.90
@ 70 kg/cm^2	10.22	10.38	10.88	9.77
@ 90 kg/cm^2	11.43	11.26	11.53	10.74
Pressure exponent	0.33	0.32	0.27	0.32
Amount of discharged noxious gases (ppm)				
NO2	0	0	0	0
NO	170	145	65	70
CO	440	215	500	220
NH3	2	4	10	6.5
total	612	364	575	296.5

4. Discussion

It is noted in the test procedures shown in Table that compositions of the present invention were prepared with two different oxygen balances and compared with analogous comparative comparisons. This was done in order to enable persons skilled in the art to make a broad-based comparison. The comparative compositions are based upon the disclosure of Barnes '183. Comparison C is equivalent to Example 2 of Barnes'183. Inventive composition A is an adjustment of Comparison C with oxygen balance. Invention B changes in oxygen balance. Comparison D was prepared by changing the oxygen balance of Invention to be equivalent to Barnes'183.

The compositions of the present invention unexpectedly generate less than half of the noxious carbon monoxide by-products generated by the analogous prior art compositions (215 ppm vs. 440 ppm, and 220 ppm vs. 500 ppm). Moreover, the total amounts of poisonous gases is much smaller with the compositions of the present invention than with the compositions representative of the prior art. (This is true in spite of the fact that the differences in amounts reported for ammonia are within experimental error.)

I hereby declare that all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true. I further declare that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of this application or any patent issued thereon.

Dated: March 24, 2004

Jianzhou Wu

Dr. Jianzhou WU